USPTO Serial Number: 09/726,928
Link C. Jaw *et al.*
Reply to Final Office Action mailed September 20, 2004

REMARKS

Applicants acknowledge the allowance of claims 1-16.

The Office Action rejects claims 23-54 under 35 U.S.C. 102(b) as being anticipated by Keeler et al.

Applicants respectfully traverse the rejection. Claim 23 recites a computer system for detecting an anomaly in a physical system comprising means for providing a model of the physical system, means for receiving a plurality of sensor measurements from the physical system, wherein at least one sensor measurement is used as an independent variable and at least one sensor measurement is used as an actual sensor measurement, means for processing the independent variable through the model of the physical system to generate an estimated variable as a function of the independent variable, and means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the physical system.

The Keeler reference discloses a physical system receiving control values x(t) and generating sensor values s(t). The plant's predictive model f(x(t),s(t)) represents the operation of the plant using the control values x(t) and sensor values s(t), see column 6, lines 54-64 and plant model 74 in FIG. 5a. The Keeler reference further discloses in FIG. 7 and text in column 9 that the control value x(t) and predicted control value $x^P(t)$ are input to multiplexer 186. The output of multiplexer 186 is run through auto associated predictive network 180 to generate $x^P(t)$. The predicted control value $x^P(t)$ is subtracted from control value x(t) by subtraction circuit 188. The difference $x(t)-x^P(t)$ is compared to thresholds 192 and the result is used to control multiplexer 186.

The Keeler reference does not teach or suggest means for receiving a plurality of sensor measurements from the physical system, wherein at least one sensor measurement is used as an independent variable and at least one sensor measurement is used as an actual sensor measurement, means for processing the independent variable through the model of the physical system to generate an estimated variable as a function of the independent variable, and means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the physical system.

Aside from the observation that control value x(t) is not disclosed in FIG. 7 as a sensor measurement, Keeler does not treat the sensor measurements as separate signals, i.e. one sensor measurement being used as an independent variable and one sensor measurement being used as an actual sensor measurement. Claim 23 recites at least one sensor measurement being used as the independent variable and at least one other sensor measurement being used as the actual sensor measurement. Even if the examiner were to relate the control value x(t) to the independent variable and predicted control value $x^p(t)$ as the estimated variable, Keeler does not then compare the estimated variable to the actual sensor measurement to determine an anomaly in the physical system. There is nothing in Keeler that justifies relating control value x(t) to both the independent variable and the actual sensor measurement. The sensor value s(t) plays no part in FIG. 7.

In contrast, claim 23 uses the independent variable and the actual sensor measurement as separate signals. The sensor measurement which is used as the independent variable generates the estimated variable, and a different sensor measurement is

used as the actual sensor measurement. Keeler does not compare the estimated variable, as derived from the independent variable, to the actual sensor measurement, which is different from the independent variable, to determine an anomaly in the physical system. At best, Keeler uses the same control value x(t) to generate predicted control values $x^p(t)$ and for the comparison to the thresholds. FIG. 7 does not anticipate the claimed features of claim 23 because there is no disclosure in Keeler that would label or separate x(t) into being both the independent variable and the actual sensor measurement.

Moreover, Keeler makes no mention of using the comparison from comparator 190 to determine an anomaly in the physical system. Comparator 190 controls multiplexer 186, which does not equate to determining an anomaly in the physical system.

Claim 23 is believed to patentably distinguish over the Keeler reference. Claims 24-31 are believed to be in condition for allowance as each is dependent from an allowable base claim.

Claim 32 recites an apparatus for detecting an anomaly in a system comprising a plurality of sensors coupled to the system for providing sensor measurements, wherein a first sensor measurement represents an independent variable and a second sensor measurement represents an actual sensor measurement. A computational system provides a model of the system. The computational system includes means for processing the independent variable through the model of the system to generate an estimated variable as a function of the independent variable, and means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the system.

For similar reasons given in the discussion of claim 23, Keeler does not teach or suggest means for processing the

independent variable through the model of the system to generate an estimated variable as a function of the independent variable, and means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the system. Keeler's FIG. 7 does not compare the estimated variable, as derived from the independent variable, to the actual sensor measurement, which is different from the independent variable, to determine an anomaly in the system.

Claim 32 is believed to patentably distinguish over the Keeler reference. Claims 33-39 are believed to be in condition for allowance as each is dependent from an allowable base claim.

Claim 40 recites a method for detecting an anomaly in a physical system comprising providing a model of the physical system, receiving a plurality of sensor measurements from the physical system, wherein a first sensor measurement is used as an independent variable and a second sensor measurement is used as an actual sensor measurement, processing the independent variable through the model of the physical system to generate an estimated variable as a function of the independent variable, and comparing the estimated variable and the actual sensor measurement to determine an anomaly in the physical system.

For similar reasons given in the discussion of claim 23, Keeler does not teach or suggest processing the independent variable through the model of the physical system to generate an estimated variable as a function of the independent variable, and comparing the estimated variable and the actual sensor measurement to determine an anomaly in the physical system. Keeler's FIG. 7 does not compare the estimated variable, as derived from the independent variable, to the actual sensor

measurement, which is different from the independent variable, to determine an anomaly in the system.

Claim 40 is believed to patentably distinguish over the Larkin reference and the other prior art of record. Claims 41-46 are believed to be in condition for allowance as each is dependent from an allowable base claim.

Claim 47 recites a system analysis tool for detecting an anomaly in a system comprising a plurality of sensors coupled to the system for providing sensor measurements, wherein a first sensor measurement is used as an independent variable and a second sensor measurement is used as an actual sensor measurement. A model of the system includes means for generating an estimated variable as a function of the independent variable, and means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the system.

For similar reasons given in the discussion of claim 23, Keeler does not teach or suggest a model of the system having means for generating an estimated variable as a function of the independent variable, and means for comparing the estimated variable and the actual sensor measurement to determine an anomaly in the system. Keeler's FIG. 7 does not compare the estimated variable, as derived from the independent variable, to the actual sensor measurement, which is different from the independent variable, to determine an anomaly in the system.

Claim 47 is believed to patentably distinguish over the Larkin reference and the other prior art of record. Claims 48-54 are believed to be in condition for allowance as each is dependent from an allowable base claim.

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Applicants believe that all information and requirements for the application have been provided to the USPTO. If there are matters that can be discussed by telephone to further the prosecution of the Application, Applicant(s) invite the Examiner to call the undersigned attorney at the Examiner's convenience.

Respectfully submitted,
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